treatment of Laplace's pressure. Otherwise I should not, in my answer, have referred to his b or to the unfortunate results of comparing his formula with experiment. I should, in fact, have contented myself with the acknowledgment that you had given an accurate account of the contents of a portion of Van der Waals's earlier chapters, which I had carelessly missed on the first hasty perusal; and that these contents justified the expression $3Kv/2$ as the virial of Laplace's pressure. But to this I should certainly have added that, even had I been fully cognizant of that portion of the pamphlet when I wrote my paper, I should probably not have modified (at least to any serious extent) the passage you quoted.

For (1) that passage contains the distinct statement that, from the statical point of view, reasons "satisfactory on the whole" were given by Van der Waals for regarding Laplace's pressure as proportional to the square of the density. And it would have been illogical on my part to object, except on the ground of insufficient generality, to the equation

$$\left(p + \frac{a}{v^2}\right)v = \tfrac{1}{3}\Sigma(mu^2),$$

though I might have regarded the mode of its establishment as obscure or even doubtful.

In fact, the equation which is one of the main features of my own paper, viz.:—

$$pv + \frac{A}{v + a} = \tfrac{1}{3}\Sigma(mu^2) \, . \left(1 + \frac{e}{v + a}\right),$$

includes it as the particular case when

$$e = 0, \quad a = 0.$$

What I objected to was a totally different thing:—viz. the above equation manipulated by the introduction of the factor $(v - b)/v$ in the left-hand member.

Again (2) the equation

$$p(v - \beta) = \tfrac{1}{3}\Sigma(mu^2)$$

is obtained in my paper (§ 64), and is there spoken of as "perfectly *legitimate*," but *only* on the distinct condition that

$$\beta\Sigma(mu^2)/3v,$$

where β is four times the sum of the volumes of the particles (§ 30), "*be small in comparison with the other terms in the* [virial] *equation*." As one of these terms is the quantity $\Sigma(mu^2)/3$ itself, this implies that for the truth of the equation β/v must be a small fraction; and it is most certainly not so at the critical point of carbonic acid, which furnished the first and one of the most important cases for the application of the virial method. In fact the equation above, when correctly obtained, comes originally in the form (in which it ought to be preserved)

$$pv = \tfrac{1}{3}\Sigma(mu^2) \, . \left(1 + \frac{\beta}{v}\right);$$

again a particular case of my own equation, viz. when

$$A = 0, \quad a = 0, \quad e = \beta.$$

Here the factor $1/v$ is (roughly) proportional to the number of collisions per particle per second, and it is in that capacity that it appears in the equation. As I said in my former letter, it is impossible (at least with Van der Waals's mode of interpreting $\Sigma(mu^2)$) to derive from this a cubic in v; even when the term a/v^2 is introduced as a simple addition to p:—unless, for the express purpose of obtaining the indispensable cubic, we write $v/(v - \beta)$ in place of $(v + \beta)/v$, on the right-hand side; which is, practically, what Van der Waals does. The true mode of getting a cubic here, if we keep to Van der Waals's interpretation of $\Sigma(mu^2)$, is to write $\beta/(v - \gamma)$ instead of β/v. This can, to a certain extent at least, be justified; the other method can not.

On the question of the introduction by Van der Waals of the factor $(v - b)/v$, whether or not it is applied alike to p and to K, I regret to find that our views must continue to differ. For it appears to me that when once the various terms of the virial equation have been correctly extracted from the expression $\Sigma(Rr)$, we have no right to modify any of them. There seems therefore to be no doubt whatever that the procedure in Van der Waals's sixth chapter is entirely wrong in principle:—except in so far as (in the German version) he borrows some correct expressions from Lorentz. The meanings of v and of p, in the term pv of the virial equation, are (from the very beginning of the inquiry) definitely assigned as total volume and external pressure:—so that this term cannot in any way be altered. No more can the term $\Sigma(mu^2)/3$, or the ratio of these two terms. Van der Waals's argument seems (for his pamphlet is everywhere somewhat obscure) to be that (when there is no molecular force) *in consequence of the finite diameters of the particles the pressure, for a given amount of kinetic energy, will be greater than if these were mere points.* Perfectly true:—but we must seek the expression for this increase of pressure in the remaining parts of the term $\Sigma(Rr)$, and *not* artificially introduce it by diminishing the multiplier of p in a term already definitely extracted. And further, if this procedure of Van der Waals were allowed to pass without protest in so far as the term pv is concerned, I think that we should logically be forced to treat the term Kv (not to the same but) to a very different factor:—for *here* the consideration of the finite volumes of the particles would appear to call for a *reduced* rather than an increased value of K; and therefore analogy would require a multiplication of the term Kv by some such expression as $(v + \gamma)/v$, where γ is essentially *positive*.—Yours very truly,

P. G. Tait.

Edinburgh, 17/10/91.

NOTES.

To-day the Senate of Cambridge University will decide whether official inquiry shall be made as to the expediency of allowing alternatives for one of the two classical languages in the Previous Examination, either to all students or to any classes of students other than those already exempted. Everyone who devotes attention to questions connected with the higher education recognizes the importance of the issue, and the discussion of the subject has been followed with wide-spread interest.

The ordinary general meeting of the Institution of Mechanical Engineers began yesterday evening, and will be continued this evening, at 25 Great George Street, Westminster. The papers to be read and discussed, as we have already stated, are by Mr. Samuel Boswell and Prof. W. C. Roberts-Austen, F.R.S.

The Geologists' Association will hold a *conversazione* at University College, Gower Street, on Friday evening, November 6. Members are invited to send exhibits, and to let the secretary know the nature of the object or objects they propose to show.

At the meeting of the Royal Horticultural Society in the Drill Hall, Westminster, on Tuesday, there was an interesting display of autumn foliage arranged for æsthetic effect. A lecture was delivered by Mr. H. J. Veitch, who urged that trees and shrubs in gardens and plantations should be selected, not only with a view to their summer beauty, but also with regard to their autumn hues; and he had many suggestions to offer as to the various ways in which these hues may be most effectively contrasted.

Prof. Boys has arranged his apparatus for the repetition of the Cavendish experiment in the basement of the Clarendon Laboratory, Oxford. The experiment will be proceeded with immediately.

We regret to have to record the death of Dr. Philip Herbert Carpenter, F.R.S., the fourth son of the late Dr. W. B. Carpenter, C.B., F.R.S. He was found dead in his dressing-room at Eton College, on Wednesday, October 21. At the inquest it was found that he had killed himself by the administration of chloroform during temporary insanity. Dr. Carpenter was in his fortieth year, and had been a science master in Eton since 1877. The following summary of his scientific work in given by the *Times*. He was a member of the scientific staff of the deep-sea exploring expeditions of Her Majesty's steamships *Lightning* (1868) and *Porcupine* (1869–70); and in 1875 he was appointed assistant naturalist to Her Majesty's ship *Valorous*, which accompanied Sir G. Nares's Arctic expedition to Disco Island, and spent the summer sounding and dredging in Davis Strait and the North Atlantic. Dr. Carpenter devoted himself continuously from 1875 to studying the morphology of the Echinoderms, more particularly of the Crinoids, both recent and fossil. In 1883 he was awarded the Lyell Fund by the Geological Society of London in recognition of the value of his work, and in 1885 was elected a Fellow of the Royal Society. His chief memoirs and papers were as follows:—"Notes on Echinoderm Morphology," i.–xi., 1878–87; "On the Genus Actinometra," 1877; "Report upon the Crinoidea dredged by H.M.S. *Challenger*," Part I. "The Stalked Crinoids," 1885, Part II. "The Comatulæ," 1888; "Report upon the Comatulæ dredged by the U.S. Coast Survey in the Caribbean Sea," 1890. In conjunction with Mr. R. Etheridge, Jun., he prepared the "Catalogue of the Blastoidea in the Geological Department of the British Museum," 1886; and he also wrote numerous papers published in the Proceedings or Transactions of the Royal, Linnean, and Geological Societies.

Mr. George Sibley, who was for many years well known as an engineer in India, and had also a considerable reputation as a traveller, died at his residence at Catherham on Sunday last at the age of sixty-seven. It is understood that Mr. Sibley has left a legacy for the purpose of founding engineering scholarships in the University of Calcutta.

Dr. J. Eduard Polak, who died at Vienna on October 8, at the age of seventy-one, was one of the most eminent Persian scholars of his time. He went in 1851 to Teheran, where he lectured at the medical school, and became physician to the Shah. During his nine years' residence in Persia he visited most parts of the country; and on his return to Vienna he wrote his well-known work, "Persien: das Land und seine Bewohner," in which he presented an excellent summary of the knowledge he had acquired. In response to an invitation from the Shah, he again visited Teheran. He read before the Geographical and Anthropological Societies of Vienna many valuable papers on Persia and its antiquities.

The International Geological excursion in America, which started on September 2 last, ended on October 9 after a most successful and interesting trip. In all there were ninety geologists, and the arrangements as regards trains, &c., left nothing to be desired. The route chosen lay through the petroleum districts of Pennsylvania, the prairies of Wisconsin, Minnesota, and Dakotah, the corn-lands of North America, and the twin centres St. Paul and Minneapolis. From the Yellowstone River the party journeyed to the beautiful geyser region of the National Park, where they made a stay of seven days, then to the rising mountain district of Butte, as well as to the Mormon town situated in the middle of the salt wastes of the Great Salt Lake. They then skirted the table-lands in South Utah, and turned towards the Rocky Mountains, where they visited the chief places of geological interest, including Pike's Peak, the Garden of the Gods, &c. At this point many of the party returned home, going by way of Chicago, Niagara Falls, and New York. The smaller number that remained undertook a laborious and exhausting expedition through the deserts of New Mexico and Arizona to the San Francisco mountains and to the Grand Cañon of Colorado; they visited a group of 165 volcanoes and craters, and also a deep valley the sides of which, with their many and various-coloured stones, fall 5800 to 6000 feet to the great Colorado River below. From this standpoint they had an excellent view of the materials composing the upper surfaces of the earth's crust, and they could not but be struck by the magnitude and grandeur of the work accomplished by Nature in digging out this enormous river cañon. The following are some of the places visited on the return journey: La Junta, Kansas City, Chicago, Niagara Falls, Albany, and Boston. Altogether the excursion was a thorough success, and the Americans deserve much credit for having arranged so good a programme for their visitors.

Prof. Russell and his party have returned from the Alaskan wilds, which they penetrated to a distance of forty miles inland, from Icy Bay to the base of Mount St. Elias. They constructed a camp, and remained there two months, making geological surveys and taking observations. Prof. Russell says:—"We began the ascent of Mount St. Elias on June 3. Our progress was not obstructed until we reached an altitude of nearly 10,000 feet. Then we found glaciers. After many perilous adventures we attained the height of 14,500 feet. This has been the estimated height of the mountain, but we found it nearly 5000 feet higher. It was impossible for us to proceed any further, as we were suffering too much from the hardships already endured. Many of the men were exhausted and very weak. The Alaskan Indians were most hospitable to us."

The report by Mr. James Dredge and Sir Henry Trueman Wood on their recent visit to Chicago is printed in the Journal of the Society of Arts (October 23). This report was presented last week to the Royal Commission which has been appointed to organize the English Section at the Chicago "World's Fair." The Commission have decided to appoint the following Committees: Finance, Fine Arts, Indian, Colonial, Engineering, General Manufactures, Electricity, Agriculture, Mines and Metallurgy, Textile Industries, Science and Education, Transportation; also a Committee of Ladies to correspond with the Ladies' Committee at Chicago. They propose to invite the assistance of Chambers of Commerce as Local Committees. A prospectus relating to the Chicago Exhibition has been issued by the Royal Commission

The Council of the Institution of Civil Engineers have issued for general circulation their regulations as to the admission of students. This is followed by an excellent account of the various educational institutions in the British dominions where instruction is given bearing on the profession of civil engineers.

In his report on the working of the Central Museum, Madras, during 1890–91, Mr. Edgar Thurston, the Superintendent, notes that he made two official tours in company with his taxidermists. During the first of these, as in several previous years, he stayed on Rámesvaram Island, where he was mainly engaged in the collection and preservation of marine worms and molluscan shells, which have since been sent to England and Germany to be worked up. Many specimens of the brightly coloured "coral-fishes," which abound over the fringing coral-reefs, were also preserved by the glycerine process introduced by Mr. A. Haly, of the Colombo Museum, for the preservation of colours. His stay on Rámesvaram Island completed, he paid a short visit to Tuticorin, to work out some doubtful points in connection with the anatomy of the pearl oyster. In his second tour he made large collections illustrative of the arts, industries, manufactures, and natural history of the places visited in the Bangalore, Hassan, Shimoga, and Mysore districts. These collections include Srávanbelgola brass-ware, Soráb and Sagar sandal-wood carving, Channapatna silk and toys, Mysore inlaid ware, gold jewellery from Bélur, butterflies, lizards, snakes, &c. A report on this tour will be published after a further visit to the Mysore province, a large area of which remains to be explored.

The other day, Mr. Flinders Petrie delivered at the Owens College, Manchester, a most interesting address on exploration in Egypt. It had been thought, he said, that the immense mounds of rubbish indicating the sites of towns had been made on purpose, but they resulted from the natural decay of the mud-brick buildings. These heaps of ruined walls and earth and potsherds rose even to eighty feet high in some places; but other ancient sites were much less imposing, and might even not attract notice on the open desert. The higher the mound the longer the place had been inhabited; and if the surface was of a late period, the earlier parts, which were most needed, were under such a depth of rubbish as to be practically inaccessible. Much could be known at first sight; and prospecting had now become as scientific a matter in antiquities as in geology. Knowing, by a glance at the sherds on the top, what was the latest period of occupation of the site, and knowing the usual rate of accumulation of a mud-brick town—about five feet in a century—we could guess how far back the bottom of the mound must be dated. Other remains had different indications. If in the midst of a great mound there was a wide flat crater, that was probably the temple site, surrounded by houses which had accumulated high on all sides of it. Speaking of the results of exploration, Mr. Petrie said that we now realized what the course of the arts had been in Egypt. In the earliest days yet known to us—about 4000 B.C.—we found great skill in executing accurate and massive stonework, such skill as had hardly ever been exceeded. We found elaborate tools used, jewelled saws and tubular drills. We saw the pictorial arts as fully developed as they were for thousands of years later. But what led up to this we were still feeling for.

To what uses did primitive men apply the stone hammers which they made in such large numbers? This question Mr. J. D. McGuire tries to answer in a paper in the *American Anthropologist* for October. His theory is that the hammer was probably "the tool upon which races living in the Stone Age relied more than upon any other object to fashion stone implements." It was used, he thinks, not only to peck an axe or celt into shape, but to rub or polish the implement after it had been shaped; and, to illustrate this, he gives a figure representing a typical hammer of quartzite, from McMinn County, Tennessee, the periphery of which is pitted by use, while the flattened sides show that it must have been a rubbing-stone as well. To prove that the work suggested could be done by a stone hammer, he represents an axe of close-grained black porphyry, which he himself pecked out and grooved by means of such an implement. The task occupied him about five hours. As ordinary stone axes are made of softer material, he thinks they were probably produced in a much shorter time.

Dr. H. von Wlislocki contributes to the current number of *Globus* a capital paper on the handicrafts of Hungarian gypsies, whom he has had many opportunities of observing. If we may judge from the illustrations, they have a considerable aptitude for design. In the summer they make bottles out of pumpkins, which they decorate with various drawings. On each bottle the space is divided into four zones, crosses being cut into the uppermost zone, serpents into the second one, circles into the third, and zigzag lines into the fourth. The crosses mean "May you be happy!"; the serpents, "May you have no enemies!"; the circles, "May you always have money!"; the zigzag lines, "May you be healthy!" Brandy is kept in the bottles; and when a guest is received, the first gypsy who drinks says, "May you be happy!"; the second, "May you have no enemies!"—and so on. Pretty walking-sticks are also among the things made by the Hungarian gypsies. On the top of one of those sketched in the article two female heads are admirably carved. These represent Ana, the Queen of the Keschalyis, or forest fairies, who dwell among the mountains, where they sit—three being always together—on rocks, spreading out their long hair over the valleys, thus giving rise to mists. Queen Ana lives in a black palace, and sometimes wanders over the world in the form of a frog. Frogs, toads, and serpents are her favourite animals. When she meets anyone in her natural form, she exclaims "Ana!", which means "Bring!" Should the person understand the cry and bring a frog, a toad, or a serpent, he is richly rewarded. If he fails to do so, he is either killed with a piece of a rock, or struck by some terrible malady.

The *Times* of October 22 has an interesting article on "Our Position with regard to Rainfall," compiled from the statistics published by Mr. Symons and the Meteorological Office. The rainfall during the present month has been so heavy that in many places the amount up to the morning of the 18th was in excess of the average for the whole month. In London this excess amounted only to 0·3 inch, while at Valentia Island and at Stornoway it amounted to nearly 2 and 3 inches respectively, and the amount which fell during the next few days has greatly increased the excess. But for the 10 years ending with 1889 the rainfall over the United Kingdom differed only by 1 per cent. from the average of the last 50 years. The values for the present year, up to the 18th instant (as shown by the last Weekly Weather Report then published), were rather in excess of the average over the southern, midland, and western parts of England, and the north of Scotland, while in the remaining districts there was still a deficiency. For the whole period since the end of 1889, there was only one district, viz. Scotland (N.), in which the total fall was in excess of the average. In Scotland and the midland and south-western counties of England, the deficiency was still very large. The question is asked—Are we likely to have in the years immediately advancing more or less rain than during the last few years? While the question cannot be answered with absolute confidence, the grouping of years into decades or other regular periods eliminates most of the non-periodic variations, and shows whether any secular alterations are taking place. There is no doubt that since 1887, at all events, the rainfall over England has been much below the average; and a consideration of all the facts leads to the conclusion that such a period of scarcity is very likely to be followed by one of abundance, and that the coming few years will probably be more rainy than those recently experienced, although possibly the increase will not occur in the summer months—at a time when it would be most noticed.

The new number of *Petermann's Mitteilungen* opens with some interesting extracts from the diary of the late Dr. Anton Stecker, written during his journey in Abyssinia and the Galla countries in 1880–83. Stecker died before he had an opportunity of writing a full and systematic account of his travels. In the present extracts he notes not only the physical characteristics of the regions to which they relate, but the manners and customs of the natives. A good map makes it easy for the reader to trace his route.

A Greek gardener lately expressed the opinion that oranges, figs, olives, and grapes grown in Australia are inferior to those grown at Smyrna and Athens. This having been brought to the attention of the Department of Agriculture, New South Wales, letters were addressed to the British Consuls at Naples and Marseilles asking for a consignment of the best varieties of grapes, figs, and olives grown in Italy and France. On receipt of these cuttings, experiments are to be carried out at the most suitable of the experimental stations about to be established throughout the colony, with a view to the propagation of the finest varieties of the respective fruits. With the same object in view application has been made to Mr. T. Hardy, of South Australia, for a number of cuttings of various vines he has cultivated, and to Sir Samuel Davenport, of Beaumont, South Australia, for cuttings of the olive and fig trees grown by him. The whole of these cuttings will go to form the standard collections of all the different kinds of fruit which it is intended to establish at each of the experimental stations.

IN the *Revue Agricole*, published in Mauritius, M. A. Daruty de Grandpré gives an account of his attempts to raise sugar-cane from seeds. The seeds were sent from Barbados by the Governor in March 1890. M. de Grandpré planted them with the greatest care, and after five days was fortunate enough to obtain five minute seedlings out of the hundred seeds used. The young plants he raised did not all prove equally vigorous, and he was able to save only one, which, at the time when his report was written, had formed a fine clump of twenty shoots with long ribbon leaves. "I believe," he says, "that we may with reason cherish the most sanguine hopes from the propagation of sugar-cane from seeds—more especially if we try an intelligent system of cross-fertilization of the varieties we possess—rather than by planting cuttings, which maintain without appreciable alteration the respective characteristics of the parent plants. Thus we shall be able to supplement the weak points in our best varieties of sugar-cane by crossing them with others which are remarkable for the qualities it is intended to infuse into them, and we shall moreover obtain, by a process of selection, a cane rich in saccharine matter, which will enable us to compete successfully against the highly improved sugar-beet."

MR. A. W. MORRIS contributes to the current number of the Journal of the Bombay Natural History Society an interesting paper on abnormal horns of the Indian antelope. We have as yet little definite information as to the cause or causes of such abnormalities. Mr. Morris suggests that severe injuries to the skull, inflicted either during battle or through some accident, are the main causes that produce abnormalities, the horn on the injured side being thrown out of its natural course by the concussion or damage sustained.

THE Academy of Natural Sciences of Philadelphia prints in its Proceedings a list of the Echinoderms obtained by Mr. Frederick Stearns, of Detroit, in the Bahama Islands in the years 1887 and 1888. The list has been drawn up by Mr. J. E. Ives. It includes a description of a new species of Amphiura.

A VALUABLE revised list of British Echinoidea, by Mr. William E. Hoyle, has been printed in the Proceedings of the Royal Physical Society, Edinburgh, and is now issued separately. The author gives a brief diagnosis of each species, such as will enable the collector to identify it on the spot.

MESSRS. J. AND A. CHURCHILL have published a second edition of the English translation of Dr. A. Chauveau's "Comparative Anatomy of the Domesticated Animals." Dr. George Fleming is the translator and editor. In preparing the new edition, Dr. Fleming has kept in view the necessities of advancing veterinary education in the English-speaking schools. He has introduced, therefore, a considerable number of "amendments, alterations, and additions."

MESSRS. HENRY SOTHERAN AND CO. propose to issue a work entitled "Game Birds and Shooting Sketches," by J. G. Millais, F.Z.S. The work will illustrate the habits, modes of capture, and stages of plumage of game birds, and the hybrids and varieties which occur among them.

THE University College of North Wales has issued its Calendar for the year 1891–92.

LECTURES on the following subjects will be given at the Royal Victoria Hall on Tuesday evenings during the month of November:—November 3, Mr. F. W. Rudler, "Some Very Ancient Britons"; November 10, Dr. Rideal, "London Fogs"; November 17, Dr. W. D. Halliburton, "Skin and Bones" (second lecture); November 24, Rev. C. E. Brooke, "A Holiday in the Far West."

THE additions to the Zoological Society's Gardens during the past week include a White-fronted Lemur (*Lemur albifrons* ♂) from Madagascar, presented by Mr. J. M. Nicholl; a Ring-tailed Coati (*Nasua rufa*) from South America, presented by Mr. A. D. Watson; a Buffon's Skua (*Stercorarius parasitica*), North European, presented by Mr. Edward Hart, F.Z.S.; two Common Cuckoos (*Cuculus canorus*), British, presented respectively by Mr. H. Lindsay and Miss Ord; a Burbot (*Lota vulgaris*) from the Trent, presented by Mr. F. T. Burrows; a Macaque Monkey (*Macacus cynomolgus* ♀) from India, a Lion Marmoset (*Midas rosalia*) from South-East Brazil, an Australian Cassowary (*Casuarius australis*) from Australia, deposited.

OUR ASTRONOMICAL COLUMN.

THE ZODIACAL LIGHT AND AURORÆ.—On the supposition that the zodiacal light is an extension of the solar corona, and that the latter mainly consists of light reflected from meteoritic particles circling round the sun over the spot zones and parallel to the plane of the equator, Mr. M. A. Veeder explains (Rochester Academy of Sciences, January 26, 1891) why in middle latitudes the phenomenon is brightest in March and October, in the former case after sunset, and in the latter before sunrise, and also the fact that at these times one margin of the band is better defined than the other, and more exactly included within the plane of the ecliptic, whilst at other seasons there is decreasing brightness, and both edges become ill-defined.

An investigation of observations of auroræ and magnetic perturbations shows that they may be arranged in periods having the same length as that of a synodic rotation of the sun. And it appears that the areas most frequented by sun-spots are most actively concerned in the production of auroræ. Extending the research, Mr. Veeder believes that the belt-like distribution of atmospheric pressure about the magnetic poles as a centre is very largely dependent upon magnetic induction of solar volcanic origin, conveyed from the sun to the earth through the medium of the coronal extensions referred to above.

COMET *e* 1891.—The following orbit has been computed by Prof. Campbell for the comet discovered by Prof. Barnard on October 2:—

$$T = 1891 \text{ November } 8{\cdot}75 \text{ G.M.T.}$$

$$\left.\begin{array}{l} \pi = 117^\circ\ 44' \\ \Omega = 215\ \ 38 \\ i = \ \ 75\ \ 50 \end{array}\right\} \text{Mean Eq. 1891.}$$

$$q = 1{\cdot}0166.$$

On October 30 the comet is in the position R.A. 10h. 53m. 7s., Decl. − 54° 43′. It is therefore not visible in our latitudes.

TWO NEW ASTEROIDS.—A new minor planet, (319), of the thirteenth magnitude was discovered by M. Charlois on October 8, and another, (320), by Dr. Palisa on October 11.

The latter observer has given the name of Thora to (299), Olga to (304), and Fraternitas to (309).

DOUBLE STARS.—Mr. S. W. Burnham announces that he is preparing a general catalogue of all the double stars discovered by him, and would be glad to receive any unpublished measures of them, Nos. 1 to 1224.

JUPITER'S FIRST SATELLITE.—Some recent observations made at Lick Observatory show that the first satellite of Jupiter is ellipsoidal, and that one of its longer axes is directed to the planet's centre.